

Y-MNJ/84
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Y-MNJ
1984

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Software Opportunities in the Mid-
TITLE
Range Computer Marketplace
BORROWER'S NAME

Y-MNJ
1984

Proposals

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August 29, 1984

Mr. Robert N. Perry
Manager, Application Software Planning
Systems Products Division
IBM Corporation
44 South Broadway
White Plains, NY 10601

Dear Mr. Perry:

Enclosed please find five copies of the final report entitled "Software Opportunities in the Mid-Range Computer Marketplace."

These reports represent the deliverable terms as described in my proposal addressed to you and dated May 9, 1984.

The data contained in these reports is consistent with the data we discussed with you in your office on August 16, 1984.

If any of the data requires further explanation or clarification, please do not hesitate in contacting me.

Very truly yours,



Richard L. Peterson

/ehk

**SOFTWARE OPPORTUNITIES
IN THE
MID-RANGE COMPUTER MARKETPLACE**

**INPUT
AUGUST 1984**

INPUT



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CONTENTS

I.	<u>Introduction</u>	1
A.	Purpose.....	1
B.	Scope.....	2
C.	Methodology.....	5
II.	<u>Executive Summary</u>	7
III.	<u>Market Overview</u>	10
A.	Market Overview.....	10
	1. Discrete Manufacturing.....	10
	2. Process Manufacturing.....	13
	3. Transportation.....	17
	4. Utilities.....	19
	5. Banking.....	20
	6. Insurance.....	23
	7. Medical.....	25
	8. Education.....	27
	9. Retail Distribution.....	29
	10. Wholesale Distribution.....	30
	11. Federal Government.....	31
	12. State/Local Government.....	34
	13. Services.....	34
	14. Cross Industry Applications.....	35
IV.	<u>Market Forecasts</u>	38
	1. Total Software	
	2. Applications Software	
	a. Total	
	b. Cross-Industry	
	c. Industry Specific	
	3. Systems Software	

LIST OF EXHIBITS

Exhibit IV-1	Total Software
Exhibit IV-1A	Total Software - Micro-Computers
Exhibit IV-1B	Total Software - Mini Computers
Exhibit IV-1C	Total Software - Mainframe Computers
Exhibit IV-2	Total Applications Software
Exhibit IV-2A	Total Applications Software - Micro-Computers
Exhibit IV-2B	Total Applications Software - Mini-Computers
Exhibit IV-2C	Total Applications Software - Mainframe Computers
Exhibit IV-3	Industry Specific Applications Software
Exhibit IV-3A	Industry Specific Applications Software - Micro-Computers
Exhibit IV-3B	Industry Specific Applications Software - Mini-Computers
Exhibit IV-3C	Industry Specific Applications Software - Mainframe Computers
Exhibit IV-4	Cross-Industry Applications Software
Exhibit IV-4A	Cross-Industry Applications Software - Micro-Computers
Exhibit IV-4B	Cross-Industry Applications Software - Mini-Computers
Exhibit IV-4C	Cross-Industry Applications Software - Mainframe Computers
Exhibit IV-5	Cross-Industry Applications Software by Application
Exhibit IV-5A	Cross-Industry Applications Software by Application - Micro-Computers
Exhibit IV-5B	Cross-Industry Applications Software by Application - Mini-Computers
Exhibit IV-5C	Cross Industry Applications Software by Application - Mainframe Computers
Exhibit IV-6	Total Systems Software
Exhibit IV-6A	Total Systems Software - Micro-Computers
Exhibit IV-6B	Total Systems Software - Mini-Computers
Exhibit IV-6C	Total Systems Software - Mainframe Computers

I. INTRODUCTION

A. PURPOSE

- This report contains forecasts of software sales for mid-range computers (purchase price \$15,000-\$350,000) for the 1983-1988 time period.
- The information contained in this report is based on the data contained in a number of other, related INPUT studies. However, the primary source document, for this report is INPUT's 1983 Annual Report, "U.S. Information Services Market, 1983-1988".
- The forecasts have been developed for a number of industry-specific markets, as well as number of cross-industry markets.
- Forecast data has been developed for:
 - 14 Industry Sectors
 - 6 Cross-Industry Applications
 - 3 Hardware Categories

- . Micro-computer - purchase price less than \$15,000
- . Mini-Computer - purchase price \$15,000-\$350,000
- . Mainframe Computers - purchase price over \$350,000

B. SCOPE

- The report encompasses forecasted software sales figures for the time period 1983-1988.
- The following forecast categories are included:
 - Industry Specific Applications Software
 - . Discrete Manufacturing
 - . Process Manufacturing
 - . Transportation
 - . Utilities
 - . Banking
 - . Insurance
 - . Medical
 - . Education
 - . Retail Distribution
 - . Wholesale Distribution
 - . Federal Government

- . State/Local Government
- . Services
- . Other

- Cross Industry Applications Software

- . Planning & Analysis
- . Accounting
- . Human Resources
- . Engineering & Scientific
- . Education & Training
- . Other

- Systems Software

- The data contained in the report is related to the following tables contained in INPUT's 1983 Annual Report.

- Exhibit B-19 - Total Software
- Exhibit B-20 - Total Applications Software
- Exhibit B-21 - Cross Industry Applications Software, by Industry Sector
- Exhibit B-22 - Industry Specific Applications Software, by Industry Sector

- Exhibit B-10 - Applications Software, Cross Industry
- Exhibit B-23 - Total Systems Software

● For each category identified above, data is presented for:

- Micro-Computers - Purchase Price under \$15,000
- Mini-Computers - Purchase Price \$15,000 to \$350,000
- Mainframe Computers - Purchase Price over \$350,000.

Note These three definitions of hardware categories were kept constant throughout the forecast period. This approach significantly affects the market forecast figures; specifically - the mini-computer software forecast figures. It is forecasted that a portion of today's mainframe hardware with a current price in excess of \$350,000 will, by 1988, be priced at less than \$350,000; given the same equipment configuration. Further, as micro-computer technology changes, it is expected that some micro-computer configurations will be priced in excess of \$15,000 and, by definition, will be re-classified as mini-computers.

When considering hardware prices, for definitional purposes, these definitions were based on a basic CPU, memory and peripheral units. Associated terminals, communication hardware, extended memory, etc. were not included as part of the purchase price.

C. METHODOLOGY

- The various tabular information from the 1983 Annual Report was analyzed using other related INPUT studies.
- The results of the analyses were:
 1. A projection of software sales data for:
 - . Mainframe Computers
 - . Mini-Computers
 - . Micro-Computers
 2. A projection, by each of the categories listed above by:
 - . Industry Segment
 - . Type of Cross Industry Application
 - . Systems Software

- These figures were reviewed by various members of the INPUT staff who have particular industry expertise. The specific industry data was then modified accordingly.
- The data was then tabulated. Each data set, as presented in the exhibits contains:
 - Forecasted dollar figures; and,
 - Forecasted market percentage figures.

- Given a constant definition of hardware prices:

- Micro-Computer - less than \$15,000
- Mini-Computer - \$15,000 - \$350,000
- Mainframe Computer - greater than \$350,000

The total market for mini-computer software will remain approximately constant during the forecast period, changing only from 43% of the market in 1982 to 45% of the market in 1988.

- There are significant variations in the mini-computer software market:

- Industry specific applications software represents a more viable market opportunity than cross-industry applications ware.
- The industry sectors with the highest potential for software revenues are:
 - . Discrete Manufacturing
 - . Banking

- . Process Manufacturing
- . Insurance
- . Medical
- . Transportation

- In general, during the forecast period, the software market will show the following patterns:

Percent of Market

	<u>Mainframe</u>	<u>Mini</u>	<u>Micro</u>	
1982	51%	43%	6%	-
1985	45%	41%	14%	
1988	38%	45%	17%	

Dollar Volume

(\$000,000's omitted)

	<u>Mainframe</u>	<u>Mini</u>	<u>Micro</u>	<u>Total</u>
1982	2,961	2,485	320	5,766
1985	6,211	5,682	1,879	13,771
1988	11,629	13,820	5,244	30,693

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- The research leading to the forecasts indicate that cross-industry applications software (e.g., Financial spreadsheets, engineering analysis) will increasingly become a market for micro-computer applications software)
- The forecasted decline in mainframe software revenues is, to a great degree, due to the re-classification of main-frame hardware to mini-computer hardware as hardware prices continue to erode.
- It is expected that in-house programming staffs will continue to generate a large percentage of the applications software for main-frame computers. This percentage will be lower for mini-computer and lower yet, as a percentage relative to micro-computers.
- Non-business micro-computer applications are not included in these forecasts.

A. MARKET OVERVIEW1. DISCRETE MANUFACTURING

a. MARKET SIZE AND GROWTH

- The discrete manufacturing marketplace is among the largest for packaged software.
- Its forecasted growth rate is also among the highest for all industries.
- Total software sales to this marketplace should grow at 32% per year over the forecast period, rising from \$1.58 billion in 1983 to \$6.37 billion by 1988.
- Application software products sales will grow even faster, at 35% per year.
- Industry-specific application software products sales will grow faster yet, at 40% per year to \$1.53 billion by 1988.

- Integrated systems sales will be the largest industry-specific market by 1988, reaching \$3.29 billion by 1988 on an annual growth rate of 30%. Integrated Manufacturing Systems will, in many cases, include mini-computers throughout the forecast period.

b. KEY ISSUES, TRENDS, AND EVENTS

- Manufacturing has suffered considerable excess capacity in recent years, primarily as a result of two successive recessions in 1979-1980 and 1981-1982.
- Competition from more efficient foreign producers is, by now, well understood for many manufacturing subsectors, even for markets within the U.S.
- The manufacturing industry is in a curious position with regard to future growth. Profit margins are most easily improved by incremental use of idle capacity, a tempting course after several years of red ink and contradiction.
- On the other hand, increased reliance on old or obsolete production facilities represents a dangerous strategy for boosting the bottom line, leading as it must to increasingly inefficient production and competitive stagnation or retreat.

- In some subsectors, for example electronics and related manufacturing, the overhead burden of obsolete plants is negligible or nonexistent, due to the sector's relative newness. Also, high and sustained levels of demand from the military have enabled many producers to maintain relatively up-to-date plants and equipment.
- In any event, the U.S. manufacturing industry seems intent on increased plant automation as a means of competing both domestically and internationally. Current political attitudes in the U.S. provide an environment that is conducive to such modernization.
- The percentage of total discrete manufacturing software attributed to mini-computer hardware will stay relatively constant during the forecast period (50%+).
- The market share attributable to micro-computers will triple during the forecast period; from 5% in 1982 to 15% in 1988.
- Mainframe software will decline significantly, as a percentage of total sales to the discrete manufacturing sector from 43 in 1982 to 32% in 1988.

- The larger manufacturing companies will continue to produce a significant amount of customized mainframe applications software through the use of in-house programming staffs.

2. PROCESS MANUFACTURING

a. MARKET SIZE AND GROWTH

- Demand for applications software in the process manufacturing sector will remain quite strong, growing from \$260 million in 1983 to \$1,200 million in 1988 - a 35% AAGR. The industry-specific portion will grow at a 41% rate for the next five years.
- Growing at a 24% AAGR, from 1983's \$450 million to 1988's \$1,290 million, integrated systems will remain the smallest component of the process manufacturing information systems marketplace. The industry-specific portion of this component will remain around 75%.

b. KEY ISSUES, TRENDS, AND EVENTS

- The process manufacturing industry sector is composed of several diverse subsectors, each with unique characteristics and requirements.

- In the chemical subsector, capacity utilization fell to the 65% to 70% range and prices fell during 1982 and 1983. Capacity utilization is especially important in this capital-intensive industry, and managers have slashed capital-expansion programs to meet the problems of over-supply. Managers have also worked to lower break-even points through cutting costs and streamlining operations; they have also pared their debt levels.
- In the petroleum subsector, energy conservation caused demand and prices to fall last year. Oil firms have reacted by modernizing refineries to operate more efficiently and by closing marginal refineries to decrease excess capacity.
- Surplus capacity in almost every phase of the industry has resulted in intensive competition in recent memory, further depressing profit margins. Demand is expected to increase only 1% per year, and the long-term demand outlook is not at all certain.

- Paper products make up another important subsector in process manufacturing. Several paper companies completed major expansion projects last year - just in time for the worst part of the depression. Demand and prices for uncoated stocks slid throughout the year, but demand for lightweight coated paper remained steady - supported by the printing industry.
- Integrated systems, including mini-computers, are expected to continue to be common in the forest-products industry.
- Automobile tires dominate the rubber industry. Dwindling original-equipment demand for tires in 1982 was partially offset by emphasis on replacement markets. But the tire manufacturers are not satisfied with growth prospects in their own industry and are actively diversifying - mainly into energy. Still, new tire demand is expected to grow 10% to 20% this year, helping earnings growth.
- In the primary metals field, steel production, shipments, employment, and operations in general fell to their lowest levels since 1938, and only a modest improvement is expected in the near future. Capacity utilization fell as low as 30%. World spot steel export prices remain 35% below domestic list prices, and imports remain largely unrestrained, increasing price pressures.

- Other metals did not fare much better; aluminum production last year over-aged about 55% of capacity, copper 38%, and lead and zinc from 40% to 50%. Many firms sustained large losses and few did respectably. There is some concern about an all-out international trade war, which would further depress prices. In any case, metals will not share a large part of the recovery and should remain weak for the foreseeable future.

- The process manufacturing industry segment exhibits the same software trends as the discrete manufacturing segment:
 - Mainframe software, as a percent of the market, will decline.

 - Mini-computer software will continue to hold approximately 50% of the total software sales for the industry segment.

 - Micro-computer software will also triple its market share from 5% in 1982 to 15% in 1988.

- A significant portion of the mini-computer installations will be oriented towards the control of multiple, special purpose micro-computers that are engaged in process control.

3. TRANSPORTATION

a. MARKET SIZE AND GROWTH

- The overall market for information services in the transportation industry stands at \$850 million in 1983. It is expected to grow to \$2.76 billion by 1988, an average annual growth rate of 27%.
- Especially noteworthy in this market is the very vigorous growth in the demand for application software.
 - From a \$160 million market in 1983, transportation should grow to a \$1.0 billion market by 1988, a compound growth of 45%.
 - This growth makes transportation the fastest growing industry market for application software.

b. KEY ISSUES, TRENDS, AND EVENTS

- No other industry, with the exception of banking, is so heavily impacted by deregulation as is the transportation industry.
- Motor freight, the largest subsector of the industry, was largely deregulated by the Motor Carrier Act of 1980.

- With applications for entry made readily available by Federal and State regulations, the number of motor freight carriers has increased from 17,000 in 1979 to 25,000 in 1982.
- Average price for shipments has declined 25 since 1978.
- The financial health of the trucking industry has suffered both from internal competition and from new competition from railroads.
- The past two years have seen the growth of intermodal freight forwarders - companies owning more than one type of transportation facility.
- Electronic tariff keeping requirements will generate a need for new software. This software is expected to be based on all three hardware categories.

4. UTILITIES INDUSTRY SECTOR

a. MARKET SIZE AND GROWTH

- The utility marketplace for information services stands at \$1.13 billion in 1983. It is expected to grow by 19% per year on average for the next five years, reaching \$2.68 billion by 1988.
- Software products will lead the growth in this market at 27% for the next five years.
- An important element of the utilities industry are the various deregulated telephone operating companies. These firms provide an expanded market for all classes of information products and services.

b. KEY ISSUES, TRENDS AND EVENTS

- The electric power generation industry is characterized by excess capacity - growth in demand for electricity has leveled off and to some extent has declined.
 - Utilities report excess capacity of 40%. Reserve generating capacity of 20% over peak load demand is considered more than adequate.

- Peak load demand fell 4% in 1982, the first decline in almost 40 years.

- The use of mini-computers in the utility industry is analagous to the process manufacturing industry; that is, mini-computers will be used in significant numbers to control networks that include micro-computers, as part of the network.
- The de-regulation of the telephone industry is expected to increase the demand for software for telephone bill-payment applications.

5. BANKING

a. MARKET SIZE AND GROWTH

- The banking sector is one of the most information intensive in the economy. Changes affecting this sector will contribute to continuing high growth in demand for information services.
- In dollar terms, banking and finance is the largest purchaser of information services.

- Next to the discrete manufacturing sector, it is the second largest market for software products, spending almost \$1.2 billion this year.
- Demand for application software is forecast to grow 36% per year, reaching \$4.3 billion in 1988.
- Growth in the size of the market exceeds that of most other sectors.

b. KEY ISSUES, TRENDS, AND EVENTS

- Several factors account for the continuing high level of demand for information services by this sector. Among the most important and continuing deregulation, mergers and acquisitions, and more rapid assimilation of electronic technologies.
- Deregulation has accelerated and its impact on banking has grown this year. The effects of earlier deregulation have caught up with the industry while the impact of new deregulation is being felt immediately.

The success of cash management accounts (CMA) offering clients money market funds, credit cards, check cashing privileges, lines of credit, and brokerage services, all in one account, has lent urgency to these efforts. CMAs are being marketed by a number of banks and brokerage houses.

- Further loosening of interest rate ceilings went into effect in October 1983, leaving only passbook savings accounts of S&L's interest-paying checking accounts, and certain time deposits left to be deregulated.
- Since the Federal Reserve Board granted CitiCorp permission to market its financial data processing services to corporations last year, other banks have asked for similar permission, raising the possibility of a new competitive force in the information services marketplace.
- New legislation proposed by the administration and the Treasury Department would allow banks to expand real estate and insurance products and to participate more in securities activities. Lack of expertise in these industries will result in the purchase of packaged software.

- It is expected that the forecasted improvement in price/performance in all three hardware categories will result in small to medium size banks migrating from a service environment to a more cost effective in-house data center environment. The lack of in-house data processing expertise will cause these banks to be purchasers of packaged industry-specific applications software.

6. INSURANCE

a. MARKET SIZE AND GROWTH

- Information service sales to the insurance industry total \$2.2 billion in 1983 and will grow to \$5.6 billion by 1988.
- Software products represent the fastest growing delivery mode of information services to the insurance industry, increasing at 28% per year over the next five years.
- Sales of industry-specific integrated systems will show strong growth, expanding 25% per year through 1988 to reach \$310 million dollars.

b. KEY ISSUES, TRENDS AND EVENTS

- Competition has been considerable for several years and intense price competition has led to severe underwriting losses for many companies.
- Also, until recently, the high interest rates earned on premiums not yet paid out had kept companies profitable; fallen interest rates have, therefore, hit companies hard.
- These forces have combined to create slow growth in the amount of business written. In 1982 there was less than a 5% increase in premiums written. There is little reason to believe that there will be appreciable growth in the near future.
- All of these issues and problems will be addressed, in varying degrees, by increased or improved automation.
- Offering these new solutions will require a higher level of knowledge of insurance needs and of how data processing is involved in insurance activities. Many times vendors can achieve this knowledge more readily than can overly large, inwardly focused information systems departments.

- Financial supermarkets will have a great need to be able to tie together information about a particular customer. This will be critical to marketing success.
- The need is analogous to that for the "Customer Information System" in banking.
- The long-range opportunity is to devise a "shell" that can fit over and unify the individual products in the supermarket.
- The percent of software sales relative to the mini-computer portion of the insurance industry will be significant from 20% in 1982 to 30% in 1988. As in the banking industry this change is primarily brought about by the re-classification of a large base of main frame hardware to mini-computer hardware.

7. MEDICAL

A. MARKET SIZE AND GROWTH

- The medical industry represents one of the best market opportunities for information service providers. The medical market as a whole will grow 25% per year for the next five years, tripling in size from \$1.61 billion in 1983 to \$4.88 billion in 1988.

- The medical market for application software products is also the fastest growing among the the economy's 14 primary industry sectors. Application software product sales are forecast to grow by 40% per year through 1988, 46% per year for industry-specific products.

b. KEY ISSUES, TRENDS, AND EVENTS

- Until recently, the medical sector has been one of the least changing and least competitive sectors. In part this has been a result of medicine's long tradition of charitable service and research.
- However, the medical sector is now in the midst of a transition from being one of the least competitive and dynamic sectors to one that promises many changes. However, change is coming piecemeal, without planning or often even awareness.
- The medical industry sector will continue to be dominated by relatively small organizations. This characteristic, together with the reclassification of main-frames will lead to:
 - a relatively low percentage (30%) of software expenditures on main-frame software in 1988

- a relatively high percentage (52% and 18%, respectively) of software expenditures for mini-computers and micro-computers

8. EDUCATION

A. MARKET SIZE AND GROWTH

- Education remains the smallest industry market for information services, totaling only \$470 million in 1983. The forecast growth rate over the 1983-1988 timeframe is 13%.
- The principal buyers in this market are primary and secondary educational institutions, colleges and universities, libraries, and vocational schools.
- Applications software sales will lead other delivery modes in terms of growth, increasing from \$80 million in 1983 to \$220 million in 1988, a 23% compound rate of increase.

b. KEY ISSUES, TRENDS, AND EVENTS

- This infusion of microcomputers has more often than not proceeded haphazardly, with little planning. It has moved forward at the insistence of parents and the encouragement of hardware vendors, who stand to gain considerable follow-on sales from students made comfortable on their equipment in the classroom.
- Software vendors do not have similar incentives because educational courseware is specialized and there is no effective linkage between classroom use and follow-on software sales. The result has been a dearth of acceptable educational courseware, but a number of firms are working to meet the new demand; educators have reported a visible improvement in software quality in the last year.
- As more attention is paid to schools by vendors and as school administrators learn how to introduce PCs more effectively, INPUT predicts increasing sophistication in the procurement of educational computer systems by schools. Software will become a more important consideration and will receive more funding, but the fundamental economic structure mitigates against the success of integrated systems, unless coordinated with manufacturers.

- Universities are also expanding their educational use of computers, again largely microcomputers. Some of the microcomputers have been donated to a few of the universities, and others have been offered at discount; again, hardware vendors recognize that exposure to their products in classrooms will lead to follow-on sales to students.
- In the school administration area, microcomputer and "friendly" minis are bringing applications in-house from RCS vendors.

9. RETAIL DISTRIBUTION

- The retail distribution sector is also a fast growing marketplace for information services. Growing at an average annual compounded rate of 21%, this market should reach \$4.35 billion by 1988.
- Growth in processing services and integrated systems rank third for all industries.
 - . Integrated systems will grow from \$290 million to \$880 million (an AAGR of 25%).

- Software products and integrated systems are expected to be the fastest growing information services for the retail distribution sector, growing at 32% and 25% respectively. The software products market is expected to reach almost \$1.6 billion by 1988 from \$390 million 1983.
- Industry-specific applications software is expected to grow from \$120 million in 1983 to \$590 million by 1988, a compound rate of 39%.
- The industry-specific integrated systems market in the retail distribution sector ranks third in growth at an average compound annual rate of 25%. This market will grow from \$130 million in 1983 to \$390 million by 1988.

10. WHOLESALE DISTRIBUTION

- Total information services for the wholesale distribution sector will grow from \$1.6 billion in 1983 to \$4.1 billion by 1988 at an average compounded growth rate of 20%.
- Industry-specific application software for this sector will expand from \$210 million in 1983 and at an average compounded rate of 35% to \$930 million by 1988. The wholesale distribution sector ranks fifth in 1988 size and sixth in growth rate for industry-specific application software.

- The industry-specific integrated systems market in this sector ranks fourth in growth at a compounded annual growth rate of 24%.

11. FEDERAL GOVERNMENT

a. MARKET SIZE AND GROWTH

- The federal government market will change character quite substantially during the remainder of this decade, with some essential and unavoidable dislocation of both in-house and commercial elements. At stake is the need for the government to steadily improve both the quality and quantity of ADP-supported services, within the confines of budget deficit reduction measures, while overcoming the handicap of a rapidly aging ADP inventory and escalating software costs.
- Key issues influencing the dynamics of change in the federal ADP environment are rising concern with system obsolescence, software productivity, and quality control problems; inadequate management computer literacy; unnecessarily complex services and systems procurement regulations; and evasive data base management standards.

- Although software costs represented 60% of the ADP system investment in 1980, they are predicted to use up to 80-85% by 1990, 90% in the last decade, unless substantial improvements take place.

- Documentation, quality control, and reproducibility are companion problem areas.

- The General Accounting Office has repeatedly reported the shortcomings of software developed for government use, because of inadequate requirements, poor pricing, incomplete documentaiton, or minimal or absent management oversight of the software production process.

- The rapidly escalating acquisition of personal computers by government personnel (engineer, scientists, program managers) has also highlighted one facet of the government's enormous data base problem - accessibility.

- The DOD Software Initiative of 1982 recommends creation of a DOD Software Engineering Institute, aimed at improving software productivity, transferability, reproducibility, and management visibility of software production.

- Several trends in federal government acquisition and the application of information services are apparent and supported by the present establishment. End-user computing, employing a range of personal computers and small business minicomputers, will experience strong growth. The avowed preference is for commercially developed operating systems and applications packages requiring a minimum of local modification. Heavy use of 8-bit machines and software will continue for several years.
- Except for research facilities and laboratories and a few very high volume service centers, the CPU trend is toward smaller mainframes operating in distributed networks, interacting with large number of personal computers. Batch type operations will be mainly employed for high volume data input (tax returns, federal forms) and output (checks, etc.). Interactive systems will be more widely used.
- Government agencies are moving toward commercial packages with minor modifications for a wide range of financial, personnel, and administrative applications (to control the increasing cost of custom programming).

12. STATE/LOCAL GOVERNMENT

- The information services industry in the state and local government sector will grow at an average compounded annual rate of 13% over the next five years.
- During this period, the information services market will grow from \$1.7 billion in 1983 to \$3.1 billion in 1988.
- The industry-specific information services market for the state and local government sector will grow from \$100 million in 1983 to \$220 million by 1988 at a compounded growth rate of 16%, as shown in Exhibit IV-36.
- As with other industry sectors, industry-specific application software and integrated systems will grow the most, reaching \$80 million and \$60 million respectively by 1988.

13. SERVICE (AND OTHER)

- Both the service and the "other" sector of the economy are composed of a variety of disparate types of business. They range from lawyers and accountants to construction, real estate, and museums.

- As a group, the industries are characterized by a large number of very small firms - frequently one- and two-people operations - and a very few very large firms, as in engineering services and accounting.
- In the services sector, the market as a whole stands at \$1.84 billion in 1983. It is expected to grow at 20% per year through 1988, reaching \$4.62 billion in 1988.
- This market has modest growth prospects, except for integrated systems, where it is forecast to be the leader. Thirty percent compound average annual growth should propel this market from a \$390 million level in 1983 to a \$1.46 billion level in 1988. These systems are expected to, in many cases, be mini-computer based.
- The 17% annual growth through 1988 is expected to produce a market demanding \$2.78 billion information services. Of that total, 40% - \$1.36 billion - will be for industry-specific services.

14. CROSS INDUSTRY APPLICATIONS

- Cross Industry Applications are identified as:
 - Planning and Analysis

- Accounting
- Human Resources
- Engineering/Scientific
- Education/Training
- Other

• The rate of growth of cross-industry application software revenues follows a pattern that is different from that exhibited by industry specific application software:

Percent of Market

	<u>1982</u>	<u>1985</u>	<u>1988</u>
Mainframe	62%	54%	45%
Mini-Computer	21%	18%	17%
Micro-Computer	17%	28%	38%

- The percentage of the market attributable to mini-computers will decline from 21% in 1982 to 17% in 1988. This is attributed to:
 - A greater use of micro-computers in running cross-industry applications software than industry specific software, that is, micros being used as stand-alone desk-top computers by managers and staff personnel.
 - The anticipation that the price of a single copy of much of this software will be low enough so that it will be purchased as a "petty change" item, outside the normal procurement process.
- Separately, the growth in micro-based human resource software revenues in part, can be attributed to the replacement of payroll services by low cost, packaged payroll software.

IV MARKET FORECASTS

This section consists of a series of six exhibits that contain software revenue forecast data by revenue dollars and by percent of the market, by hardware type.

In each case the primary table contains the same data that appeared in INPUT's December 1983 Annual Report. The supplementary tables (A, B and C) contain revenue data by hardware type. The supplementary tables A, B and C contain the same data by percent.

EXHIBIT IV-1

TOTAL SOFTWARE

	1982 (\$M)	1983 (\$M)	1984 (\$M)	1985 (\$M)	1986 (\$M)	1987 (\$M)	1988 (\$M)
TOTAL SOFTWARE							
Discrete Manufacturing	1174	1583	2144	2857	3776	4933	6367
Process Manufacturing	618	799	1049	1389	1862	2495	3346
Transportation	214	305	435	612	855	1186	1640
Utilities	181	236	312	406	513	634	775
Banking	855	1165	1612	2193	2940	3917	5222
Insurance	620	788	1024	1335	1710	2162	2692
Medical	283	419	610	867	1198	1586	2073
Education	109	134	164	199	239	283	332
Retail Distribution	290	390	522	696	924	1216	1590
Wholesale Distribution	376	508	678	895	1169	1506	1937
Federal Government	480	639	846	1102	1419	1784	2172
State/Local Government	191	232	279	329	388	454	530
Services	197	263	350	465	612	801	1048
Other	178	241	321	426	563	741	969
GRAND TOTAL	5766	7702	10346	13771	18168	23698	30693

INPUT

EXHIBIT IV-1A

TOTAL SOFTWARE

MICROCOMPUTERS

	1982 (\$M)	1983 (\$M)	1984 (\$M)	1985 (\$M)	1986 (\$M)	1987 (\$M)	1988 (\$M)
TOTAL SOFTWARE							
Discrete Manufacturing	54	116	216	358	520	728	970
Process Manufacturing	28	58	106	168	244	335	482
Transportation	11	26	55	93	149	233	350
Utilities	5	15	30	49	64	88	116
Banking	71	134	211	324	439	629	836
Insurance	38	63	115	176	242	315	419
Medical	19	40	76	127	200	276	384
Education	6	11	14	18	28	41	54
Retail Distribution	17	35	66	109	167	237	337
Wholesale Distribution	25	50	94	164	232	316	426
Federal Government	7	35	73	117	179	263	342
State/Local Government	5	16	28	42	55	70	86
Services	13	27	45	68	113	176	254
Other	18	26	37	60	80	119	170
GRAND TOTAL	316	651	1165	1874	2712	3825	5226

INPUT

EXHIBIT IV-1A'

TOTAL SOFTWARE

MICROCOMPUTERS

	1982 (%)	1983 (%)	1984 (%)	1985 (%)	1986 (%)	1987 (%)	1988 (%)
TOTAL SOFTWARE							
Discrete Manufacturing	5	7	10	13	14	15	15
Process Manufacturing	5	7	10	12	13	13	15
Transportation	5	9	13	15	17	20	21
Utilities	3	6	10	12	12	14	15
Banking	8	12	13	15	15	16	16
Insurance	6	8	11	13	14	15	16
Medical	7	10	12	15	17	17	19
Education	5	8	9	9	12	14	16
Retail Distribution	6	9	13	16	18	19	21
Wholesale Distribution	7	10	14	18	20	21	22
Federal Government	1	6	9	11	13	15	16
State/Local Government	2	7	10	13	14	15	16
Services	6	10	13	15	19	22	24
Other	10	11	12	14	14	16	18

INPUT

EXHIBIT IV-1B

TOTAL SOFTWARE

MINI-COMPUTERS

	1982	1983	1984	1985	1986	1987	1988
	(\$M)	(\$M)	(\$M)	(\$M)	(\$M)	(\$M)	(\$M)
TOTAL SOFTWARE							
Discrete Manufacturing	610	807	1071	1427	1925	2564	3376
Process Manufacturing	309	400	513	679	929	1271	1738
Transportation	68	95	126	171	242	348	471
Utilities	92	118	153	195	252	317	388
Banking	282	374	518	727	1116	1610	2337
Insurance	124	165	228	307	433	628	808
Medical	153	222	317	442	600	813	1079
Education	48	59	74	91	114	140	172
Retail Distribution	125	164	214	278	379	511	672
Wholesale Distribution	207	269	346	431	548	703	890
Federal Government	168	211	262	331	426	517	651
State/Local Government	94	108	127	147	173	211	255
Services	110	139	181	233	293	367	476
Other	95	129	173	224	297	384	500
GRAND TOTAL	2485	3259	4304	5684	7727	10384	13812

INPUT

EXHIBIT IV-1B'

TOTAL SOFTWARE

MINI-COMPUTERS

	1982 (%)	1983 (%)	1984 (%)	1985 (%)	1986 (%)	1987 (%)	1988 (%)
TOTAL SOFTWARE							
Discrete Manufacturing	52	51	50	50	51	52	53
Process Manufacturing	50	50	49	49	50	51	52
Transportation	32	31	29	28	28	29	29
Utilities	51	50	49	48	49	50	50
Banking	33	32	32	33	38	41	45
Insurance	20	21	22	23	25	29	30
Medical	54	53	52	51	50	51	52
Education	44	44	45	46	48	50	52
Retail Distribution	43	42	41	40	41	42	42
Wholesale Distribution	55	53	51	48	47	47	46
Federal Government	35	33	31	30	30	29	30
State/Local Government	49	47	46	45	45	46	48
Services	56	53	52	50	48	46	45
Other	53	54	54	53	53	52	51

INPUT

EXHIBIT IV-1C

TOTAL SOFTWARE

MAINFRAME COMPUTERS

	1982 (\$M)	1983 (\$M)	1984 (\$M)	1985 (\$M)	1986 (\$M)	1987 (\$M)	1988 (\$M)
TOTAL SOFTWARE							
Discrete Manufacturing	509	659	853	1071	1332	1641	2022
Process Manufacturing	281	342	430	542	689	884	1119
Transportation	134	185	253	347	462	605	814
Utilities	84	103	129	162	198	229	272
Banking	502	657	889	1142	1386	1678	2034
Insurance	458	559	680	852	1035	1219	1466
Medical	111	157	217	297	397	497	610
Education	55	65	76	89	98	102	106
Retail Distribution	149	191	242	308	378	469	580
Wholesale Distribution	144	189	241	300	389	487	621
Federal Government	305	393	511	654	814	1004	1180
State/Local Government	93	108	124	141	159	174	190
Services	74	96	124	164	203	258	319
Other	65	85	111	142	185	238	299
GRAND TOTAL	2964	3789	4878	6213	7724	9484	11630

INPUT

EXHIBIT IV-1C'

TOTAL SOFTWARE

MAINFRAME COMPUTERS

	1982 (%)	1983 (%)	1984 (%)	1985 (%)	1986 (%)	1987 (%)	1988 (%)
TOTAL SOFTWARE							
Discrete Manufacturing	43	42	40	37	35	33	32
Process Manufacturing	45	43	41	39	37	36	33
Transportation	63	60	58	57	54	51	50
Utilities	46	44	41	40	39	36	35
Banking	59	56	55	52	47	43	39
Insurance	74	71	67	64	61	56	54
Medical	39	37	36	34	33	31	29
Education	51	48	46	45	41	36	32
Retail Distribution	51	49	46	44	41	39	36
Wholesale Distribution	38	37	35	34	33	32	32
Federal Government	64	61	60	59	57	56	54
State/Local Government	49	47	45	43	41	38	36
Services	38	37	36	35	33	32	30
Other	37	35	34	33	33	32	31

INPUT

EXHIBIT IV-2
TOTAL APPLICATIONS SOFTWARE

	1982	1983	1984	1985	1986	1987	1988
	(\$M)	(\$M)	(\$M)	(\$M)	(\$M)	(\$M)	(\$M)
TOTAL APPLICATIONS							
Discrete Manufacturing	509	672	914	1234	1665	2232	2990
Process Manufacturing	200	264	353	478	650	883	1202
Transportation	105	158	235	342	493	701	995
Utilities	60	79	103	134	173	223	285
Banking	683	936	1301	1782	2406	3223	4320
Insurance	436	545	703	921	1189	1521	1916
Medical	195	298	448	654	921	1234	1629
Education	61	77	97	121	150	183	220
Retail Distribution	194	258	343	463	626	844	1140
Wholesale Distribution	290	394	528	703	927	1206	1568
Federal Government	35	65	88	117	148	183	219
State/Local Government	51	64	81	101	126	155	189
Services	139	188	253	340	455	605	805
Other	123	170	229	309	414	552	733
TOTAL	3081	4168	5676	7699	10343	13745	18211

INPUT

EXHIBIT IV-2A

TOTAL APPLICATIONS SOFTWARE

MICROCOMPUTERS

	1982 (\$M)	1983 (\$M)	1984 (\$M)	1985 (\$M)	1986 (\$M)	1987 (\$M)	1988 (\$M)
TOTAL APPLICATIONS							
Discrete Manufacturing	34	62	117	196	287	404	565
Process Manufacturing	15	26	50	77	110	158	225
Transportation	8	17	35	61	98	161	247
Utilities	4	7	13	22	30	43	58
Banking	67	120	183	282	385	553	728
Insurance	34	54	93	139	190	244	326
Medical	16	33	63	104	167	234	326
Education	4	7	9	11	18	28	39
Retail Distribution	14	26	49	79	126	177	261
Wholesale Distribution	23	43	80	139	196	265	359
Federal Government	2	7	12	18	26	38	49
State/Local Government	3	6	10	14	21	28	38
Services	12	22	36	54	90	141	208
Other	15	20	30	50	67	100	147

INPUT

EXHIBIT IV-2A'

TOTAL APPLICATIONS SOFTWARE

MICROCOMPUTERS

	1982 (%)	1983 (%)	1984 (%)	1985 (%)	1986 (%)	1987 (%)	1988 (%)
TOTAL APPLICATIONS							
Discrete Manufacturing	7	9	13	16	17	18	19
Process Manufacturing	8	10	14	16	17	18	19
Transportation	8	11	15	18	20	23	25
Utilities	6	9	13	16	17	19	20
Banking	10	13	14	16	16	17	17
Insurance	8	10	13	15	16	16	17
Medical	8	11	14	16	18	19	20
Education	7	9	9	9	12	15	18
Retail Distribution	7	10	14	17	20	21	23
Wholesale Distribution	8	11	15	20	21	22	23
Federal Government	7	10	14	16	18	21	22
State/Local Government	6	9	12	14	17	18	20
Services	8	12	14	16	20	23	26
Other	12	12	13	16	16	18	20

INPUT

EXHIBIT IV-2B

TOTAL APPLICATIONS SOFTWARE

MINI-COMPUTERS

	1982 (\$M)	1983 (\$M)	1984 (\$M)	1985 (\$M)	1986 (\$M)	1987 (\$M)	1988 (\$M)
TOTAL APPLICATIONS							
Discrete Manufacturing	265	343	456	616	848	1160	1586
Process Manufacturing	100	132	172	233	323	448	623
Transportation	34	49	68	96	137	203	277
Utilities	31	39	50	65	85	111	143
Banking	225	301	418	591	918	1318	1940
Insurance	87	114	155	212	297	442	575
Medical	105	158	233	334	459	630	844
Education	27	34	43	55	72	91	114
Retail Distribution	83	108	141	185	257	354	479
Wholesale Distribution	160	209	270	339	434	565	720
Federal Government	12	21	27	35	45	53	65
State/Local Government	25	31	38	46	58	73	91
Services	78	99	132	171	217	277	364
Other	65	92	124	160	215	280	368
TOTAL	1297	1730	2326	3138	4366	6006	8189

INPUT

EXHIBIT IV-2B
TOTAL APPLICATIONS SOFTWARE

MINI-COMPUTERS

	1982 (%)	1983 (%)	1984 (%)	1985 (%)	1986 (%)	1987 (%)	1988 (%)
TOTAL APPLICATIONS							
Discrete Manufacturing	52	51	50	50	51	52	53
Process Manufacturing	50	50	49	49	50	51	52
Transportation	32	31	29	28	28	29	28
Utilities	51	50	49	48	49	50	50
Banking	33	32	32	33	38	41	45
Insurance	20	21	22	23	25	29	30
Medical	54	53	52	51	50	51	52
Education	44	44	45	46	48	50	52
Retail Distribution	43	42	41	40	41	42	42
Wholesale Distribution	55	53	51	48	47	47	46
Federal Government	35	33	31	30	30	29	30
State/Local Government	49	48	47	46	46	47	48
Services	56	53	52	50	48	46	45
Other	53	54	54	52	52	51	50

INPUT

EXHIBIT IV-2C

TOTAL APPLICATIONS SOFTWARE

MAINFRAME COMPUTERS

	1982	1983	1984	1985	1986	1987	1988
	(\$M)	(\$M)	(\$M)	(\$M)	(\$M)	(\$M)	(\$M)
TOTAL APPLICATIONS							
Discrete Manufacturing	210	268	336	422	529	668	840
Process Manufacturing	85	106	131	168	216	272	347
Transportation	63	92	131	185	255	338	466
Utilities	26	33	39	48	58	69	86
Banking	390	515	705	908	1102	1352	1637
Insurance	315	377	456	570	702	834	1016
Medical	74	107	152	216	295	370	459
Education	30	36	44	54	60	64	66
Retail Distribution	97	124	154	199	244	312	400
Wholesale Distribution	108	142	181	225	297	376	488
Federal Government	20	37	48	63	77	92	105
State/Local Government	23	28	33	41	47	54	60
Services	50	65	85	115	145	187	233
Other	43	58	76	99	132	172	218
TOTAL	1533	1987	2571	3314	4160	5161	6422

INPUT

EXHIBIT IV-2C'

TOTAL APPLICATIONS SOFTWARE

MAINFRAME COMPUTERS

	1982 (%)	1983 (%)	1984 (%)	1985 (%)	1986 (%)	1987 (%)	1988 (%)
TOTAL APPLICATIONS							
Discrete Manufacturing	41	40	37	34	24	30	28
Process Manufacturing	42	40	37	35	24	31	29
Transportation	60	58	56	54	36	48	47
Utilities	43	41	38	36	26	31	30
Banking	57	55	54	51	34	42	38
Insurance	72	69	65	62	46	55	53
Medical	38	36	34	33	24	30	28
Education	49	47	46	45	33	35	30
Retail Distribution	50	48	45	43	29	37	35
Wholesale Distribution	37	36	34	32	25	31	31
Federal Government	58	57	55	54	42	50	48
State/Local Government	45	43	41	40	30	35	32
Services	36	35	34	34	24	31	29
Other	35	34	33	32	24	31	30

INPUT

EXHIBIT IV-3

INDUSTRY SPECIFIC APPLICATIONS SOFTWARE

	1982 (\$M)	1983 (\$M)	1984 (\$M)	1985 (\$M)	1986 (\$M)	1987 (\$M)	1988 (\$M)
APPLICATIONS SOFTWARE							
INDUSTRY SPECIFIC							
Discrete Manufacturing	214	282	400	563	789	1098	1525
Process Manufacturing	66	87	122	173	246	348	493
Transportation	47	71	107	158	231	332	478
Utilities	23	30	40	52	68	88	114
Banking	382	524	752	1062	1477	2037	2808
Insurance	231	289	382	514	680	891	1150
Medical	94	143	224	340	497	691	945
Education	24	31	40	50	64	79	97
Retail Distribution	87	116	159	221	308	427	593
Wholesale Distribution	151	205	282	385	521	695	925
Federal Government	7	13	18	25	32	41	50
State/Local Government	18	22	29	37	48	60	76
Services	47	64	89	124	171	235	322
Other	47	65	92	130	182	254	352
Subtotal	1438	1942	2736	3834	5314	7276	9928

INPUT

EXHIBIT IV-3A

INDUSTRY SPECIFIC APPLICATIONS SOFTWARE

MICROCOMPUTERS

	1982 (\$M)	1983 (\$M)	1984 (\$M)	1985 (\$M)	1986 (\$M)	1987 (\$M)	1988 (\$M)
APPLICATIONS SOFTWARE							
INDUSTRY SPECIFIC							
Discrete Manufacturing	11	23	40	62	95	132	198
Process Manufacturing	3	6	11	19	30	45	69
Transportation	2	6	12	21	32	50	76
Utilities	1	2	3	5	7	11	15
Banking	19	42	68	117	162	244	365
Insurance	12	20	38	62	88	125	173
Medical	6	13	25	44	70	104	142
Education	1	2	4	6	8	10	14
Retail Distribution	4	10	19	33	52	81	119
Wholesale Distribution	6	14	31	50	78	111	167
Federal Government	0	1	2	3	4	6	8
State/Local Government	1	2	3	4	6	8	11
Services	2	5	10	17	27	45	68
Other	2	5	9	16	27	43	70
Subtotal	70	151	274	458	687	1014	1493

INPUT

EXHIBIT IV-3A'

INDUSTRY SPECIFIC APPLICATIONS SOFTWARE

MICROCOMPUTERS

	1982 (%)	1983 (%)	1984 (%)	1985 (%)	1986 (%)	1987 (%)	1988 (%)
APPLICATIONS SOFTWARE							
INDUSTRY SPECIFIC							
Discrete Manufacturing	5	8	10	11	12	12	13
Process Manufacturing	5	7	9	11	12	13	14
Transportation	5	8	11	13	14	15	16
Utilities	3	6	8	10	11	12	13
Banking	5	8	9	11	11	12	13
Insurance	5	7	10	12	13	14	15
Medical	6	9	11	13	14	15	15
Education	5	8	10	11	12	13	14
Retail Distribution	5	9	12	15	17	19	20
Wholesale Distribution	4	7	11	13	15	16	18
Federal Government	3	7	9	11	13	14	16
State/Local Government	3	7	9	11	12	13	14
Services	5	8	11	14	16	19	21
Other	5	8	10	12	15	17	20

INPUT

EXHIBIT IV-3B

INDUSTRY SPECIFIC APPLICATIONS SOFTWARE

MINI-COMPUTERS

	1982 (\$M)	1983 (\$M)	1984 (\$M)	1985 (\$M)	1986 (\$M)	1987 (\$M)	1988 (\$M)
APPLICATIONS SOFTWARE							
INDUSTRY SPECIFIC							
Discrete Manufacturing	111	144	204	287	410	593	839
Process Manufacturing	33	44	61	87	125	181	261
Transportation	15	22	32	46	72	103	153
Utilities	12	15	20	26	35	45	59
Banking	126	173	248	361	546	856	1320
Insurance	46	61	84	118	170	241	345
Medical	51	76	116	177	268	380	529
Education	11	14	18	24	31	40	51
Retail Distribution	38	50	65	88	126	179	249
Wholesale Distribution	85	111	147	193	255	341	444
Federal Government	2	4	6	8	10	13	16
State/Local Government	9	11	14	17	23	29	38
Services	26	35	46	61	84	110	151
Other	26	34	47	64	86	119	158
Subtotal	591	792	1109	1556	2242	3230	4614

INPUT

EXHIBIT IV-3B'

INDUSTRY SPECIFIC APPLICATIONS SOFTWARE

MINI-COMPUTERS

	1982 (%)	1983 (%)	1984 (%)	1985 (%)	1986 (%)	1987 (%)	1988 (%)
APPLICATIONS SOFTWARE							
INDUSTRY SPECIFIC							
Discrete Manufacturing	52	51	51	51	52	54	55
Process Manufacturing	50	50	50	50	51	52	53
Transportation	32	31	30	29	31	31	32
Utilities	51	51	50	50	51	51	52
Banking	33	33	33	34	37	42	47
Insurance	20	21	22	23	25	27	30
Medical	54	53	52	52	54	55	56
Education	44	45	46	47	49	51	53
Retail Distribution	44	43	41	40	41	42	42
Wholesale Distribution	56	54	52	50	49	49	48
Federal Government	35	33	32	31	31	32	32
State/Local Government	49	48	47	47	48	49	50
Services	56	54	52	49	49	47	47
Other	55	52	51	49	47	47	45

INPUT

EXHIBIT IV-3C

INDUSTRY SPECIFIC APPLICATIONS SOFTWARE

MAINFRAME COMPUTERS

	1982	1983	1984	1985	1986	1987	1988
	(\$M)	(\$M)	(\$M)	(\$M)	(\$M)	(\$M)	(\$M)
APPLICATIONS SOFTWARE							
INDUSTRY SPECIFIC							
Discrete Manufacturing	92	116	156	214	284	373	488
Process Manufacturing	30	37	50	67	91	122	163
Transportation	30	43	63	92	127	179	249
Utilities	11	13	17	21	26	33	40
Banking	237	309	436	584	768	937	1123
Insurance	173	208	260	334	422	526	633
Medical	38	54	83	119	159	207	274
Education	12	15	18	21	25	28	32
Retail Distribution	44	56	75	99	129	167	225
Wholesale Distribution	60	80	104	142	188	243	315
Federal Government	4	8	11	15	18	22	26
State/Local Government	9	10	13	16	19	23	27
Services	18	24	33	46	60	80	103
Other	19	26	36	51	69	91	123
Subtotal	777	999	1354	1821	2385	3031	3820

INPUT

EXHIBIT IV-3C'

INDUSTRY SPECIFIC APPLICATIONS SOFTWARE

MAINFRAME COMPUTERS

	1982 (%)	1983 (%)	1984 (%)	1985 (%)	1986 (%)	1987 (%)	1988 (%)
APPLICATIONS SOFTWARE							
INDUSTRY SPECIFIC							
Discrete Manufacturing	43	41	39	38	36	34	32
Process Manufacturing	45	43	41	39	37	35	33
Transportation	63	61	59	58	55	54	52
Utilities	46	43	42	40	38	37	35
Banking	62	59	58	55	52	46	40
Insurance	75	72	68	65	62	59	55
Medical	40	38	37	35	32	30	29
Education	51	47	44	42	39	36	33
Retail Distribution	51	48	47	45	42	39	38
Wholesale Distribution	40	39	37	37	36	35	34
Federal Government	62	60	59	58	56	54	52
State/Local Government	48	45	44	42	40	38	36
Services	39	38	37	37	35	34	32
Other	40	40	39	39	38	36	35

INPUT

EXHIBIT IV-4

CROSS INDUSTRY APPLICATIONS SOFTWARE

	1982 (\$M)	1983 (\$M)	1984 (\$M)	1985 (\$M)	1986 (\$M)	1987 (\$M)	1988 (\$M)
CROSS INDUSTRY							
Discrete Manufacturing	295	390	514	671	876	1134	1465
Process Manufacturing	134	177	231	305	404	535	709
Transportation	58	87	128	184	262	369	517
Utilities	37	49	63	82	105	135	171
Banking	301	412	549	720	929	1186	1512
Insurance	205	256	321	407	509	630	766
Medical	101	155	224	314	424	543	684
Education	37	46	57	71	86	104	123
Retail Distribution	107	142	184	242	318	417	547
Wholesale Distribution	139	189	246	318	406	511	643
Federal Government	28	52	70	92	116	142	169
State/Local Government	33	42	52	64	78	95	113
Services	92	124	164	216	284	370	483
Other	76	105	137	179	232	298	381
Subtotal	1643	2226	2940	3865	5029	6469	8283

INPUT

EXHIBIT IV-4A

CROSS INDUSTRY APPLICATIONS SOFTWARE

MICROCOMPUTERS

	1982 (\$M)	1983 (\$M)	1984 (\$M)	1985 (\$M)	1986 (\$M)	1987 (\$M)	1988 (\$M)
CROSS INDUSTRY							
Discrete Manufacturing	24	39	77	134	193	272	366
Process Manufacturing	12	19	39	58	81	112	156
Transportation	6	11	23	40	66	111	171
Utilities	3	5	10	16	22	32	43
Banking	48	78	115	166	223	308	363
Insurance	23	33	55	77	102	120	153
Medical	10	20	38	60	98	130	185
Education	3	5	5	6	10	18	26
Retail Distribution	10	16	29	46	73	96	142
Wholesale Distribution	17	28	49	89	118	153	193
Federal Government	2	6	11	16	22	33	41
State/Local Government	3	4	7	10	16	20	27
Services	9	17	26	37	62	96	140
Other	12	15	21	34	39	57	76
Subtotal	181	297	505	789	1124	1558	2081

INPUT

EXHIBIT IV-4A'

CROSS INDUSTRY APPLICATIONS SOFTWARE

MICROCOMPUTERS

	1982 (%)	1983 (%)	1984 (%)	1985 (%)	1986 (%)	1987 (%)	1988 (%)
CROSS INDUSTRY							
Discrete Manufacturing	8	10	15	20	22	24	25
Process Manufacturing	9	11	17	19	20	21	22
Transportation	10	13	18	22	25	30	33
Utilities	8	11	16	20	21	24	25
Banking	16	19	21	23	24	26	24
Insurance	11	13	17	19	20	19	20
Medical	10	13	17	19	23	24	27
Education	8	10	8	8	12	17	21
Retail Distribution	9	11	16	19	23	23	26
Wholesale Distribution	12	15	20	28	29	30	30
Federal Government	8	11	15	17	19	23	24
State/Local Government	8	10	14	16	20	21	24
Services	10	14	16	17	22	26	29
Other	16	14	15	19	17	19	20

INPUT

EXHIBIT IV-4B

CROSS INDUSTRY APPLICATIONS SOFTWARE

MINI-COMPUTERS

	1982 (\$M)	1983 (\$M)	1984 (\$M)	1985 (\$M)	1986 (\$M)	1987 (\$M)	1988 (\$M)
CROSS INDUSTRY							
Discrete Manufacturing	153	199	252	329	438	567	747
Process Manufacturing	67	89	111	146	198	268	362
Transportation	19	27	36	50	66	100	124
Utilities	19	24	30	39	50	66	84
Banking	99	128	170	230	372	463	620
Insurance	41	54	71	94	127	202	230
Medical	55	82	116	157	191	250	315
Education	16	20	25	32	40	51	63
Retail Distribution	45	58	75	97	130	175	230
Wholesale Distribution	75	98	123	146	179	225	276
Federal Government	10	17	22	28	35	40	49
State/Local Government	16	20	24	29	35	44	53
Services	52	64	85	110	133	167	213
Other	40	58	77	97	130	161	210
Subtotal	706	938	1218	1583	2124	2776	3574

INPUT

EXHIBIT IV-4B'

CROSS INDUSTRY APPLICATIONS SOFTWARE

MINI-COMPUTERS

	1982 (%)	1983 (%)	1984 (%)	1985 (%)	1986 (%)	1987 (%)	1988 (%)
CROSS INDUSTRY							
Discrete Manufacturing	52	51	49	49	50	50	51
Process Manufacturing	50	50	48	48	49	50	51
Transportation	32	31	28	27	25	27	24
Utilities	51	49	48	47	48	49	49
Banking	33	31	31	32	40	39	41
Insurance	20	21	22	23	25	32	30
Medical	54	53	52	50	45	46	46
Education	44	43	44	45	47	49	51
Retail Distribution	42	41	41	40	41	42	42
Wholesale Distribution	54	52	50	46	44	44	43
Federal Government	35	33	31	30	30	28	29
State/Local Government	49	48	47	45	45	46	47
Services	56	52	52	51	47	45	44
Other	52	55	56	54	56	54	55

INPUT

EXHIBIT IV-4C

CROSS INDUSTRY APPLICATIONS SOFTWARE

MAINFRAME COMPUTERS

	1982 (\$M)	1983 (\$M)	1984 (\$M)	1985 (\$M)	1986 (\$M)	1987 (\$M)	1988 (\$M)
CROSS INDUSTRY							
Discrete Manufacturing	118	152	180	208	245	295	352
Process Manufacturing	55	69	81	101	125	150	184
Transportation	34	49	68	94	128	159	217
Utilities	15	20	22	27	33	36	46
Banking	154	206	269	324	334	415	514
Insurance	141	169	196	236	280	309	383
Medical	36	53	69	97	136	163	185
Education	18	22	27	33	35	35	34
Retail Distribution	52	68	79	99	114	146	175
Wholesale Distribution	47	62	76	83	110	133	174
Federal Government	16	29	38	49	59	70	79
State/Local Government	14	18	20	25	27	31	33
Services	31	41	52	69	85	107	130
Other	24	32	40	48	63	80	95
Subtotal	756	988	1217	1493	1775	2129	2602

INPUT

EXHIBIT IV-4C'

CROSS INDUSTRY APPLICATIONS SOFTWARE

MAINFRAME COMPUTERS

	1982 (%)	1983 (%)	1984 (%)	1985 (%)	1986 (%)	1987 (%)	1988 (%)
CROSS INDUSTRY							
Discrete Manufacturing	40	39	35	31	28	26	24
Process Manufacturing	41	39	35	33	31	28	26
Transportation	58	56	53	51	49	43	42
Utilities	41	40	35	33	31	27	27
Banking	51	50	49	45	36	35	34
Insurance	69	66	61	58	55	49	50
Medical	36	34	31	31	32	30	27
Education	48	47	47	47	41	34	28
Retail Distribution	49	48	43	41	36	35	32
Wholesale Distribution	34	33	31	26	27	26	27
Federal Government	57	56	54	53	51	49	47
State/Local Government	43	42	39	39	35	33	29
Services	34	33	32	32	30	29	27
Other	32	30	29	27	27	27	25

INPUT

EXHIBIT IV-5

CROSS INDUSTRY APPLICATIONS SOFTWARE
(BY APPLICATION)

	1982 (\$M)	1983 (\$M)	1984 (\$M)	1985 (\$M)	1986 (\$M)	1987 (\$M)	1988 (\$M)
CROSS INDUSTRY (BY APPLICATION)							
Planning & Analysis	408	631	944	1357	1878	2539	3247
Accounting	582	768	977	1244	1573	1969	2503
Human Resources	255	309	369	436	508	584	714
Engineering/Scientific	100	125	151	186	235	295	382
Education/Training	35	51	81	127	195	301	469
Other	263	341	419	516	639	781	967
Subtotal	1643	2225	2941	3866	5028	6469	8282

INPUT

EXHIBIT IV-5A

CROSS INDUSTRY APPLICATIONS SOFTWARE
(BY APPLICATION)

MICROCOMPUTERS

	1982 (\$M)	1983 (\$M)	1984 (\$M)	1985 (\$M)	1986 (\$M)	1987 (\$M)	1988 (\$M)
CROSS INDUSTRY (BY APPLICATION)							
Planning & Analysis	69	126	227	380	545	762	1039
Accounting	35	61	117	187	267	374	526
Human Resources	8	9	15	22	30	41	64
Engineering/Scientific	8	11	15	22	33	44	57
Education/Training	10	15	26	46	72	111	174
Other	58	75	109	155	198	250	309
Subtotal	188	298	509	811	1146	1582	2169

INPUT

EXHIBIT IV-5A'

CROSS INDUSTRY APPLICATIONS SOFTWARE
(BY APPLICATION)

MICROCOMPUTERS

	1982	1983	1984	1985	1986	1987	1988
	(%)	(%)	(%)	(%)	(%)	(%)	(%)
CROSS INDUSTRY (BY APPLICATION)							
Planning & Analysis	17	20	24	28	29	30	32
Accounting	6	8	12	15	17	19	21
Human Resources	3	3	4	5	6	7	9
Engineering/Scientific	8	9	10	12	14	15	15
Education/Training	29	30	32	36	37	37	37
Other	22	22	26	30	31	32	32

INPUT

EXHIBIT IV-5B

CROSS INDUSTRY APPLICATIONS SOFTWARE
(BY APPLICATION)

MINI-COMPUTERS

	1982	1983	1984	1985	1986	1987	1988
	(\$M)	(\$M)	(\$M)	(\$M)	(\$M)	(\$M)	(\$M)
CROSS INDUSTRY (BY APPLICATION)							
Planning & Analysis	163	246	359	502	732	990	1266
Accounting	268	346	410	522	692	866	1101
Human Resources	120	145	177	214	259	310	407
Engineering/Scientific	44	55	68	84	110	142	191
Education/Training	12	17	28	42	66	105	174
Other	95	130	155	186	236	297	377
Subtotal	701	939	1197	1550	2097	2710	3516

INPUT

EXHIBIT IV-5B`

CROSS INDUSTRY APPLICATIONS SOFTWARE
(BY APPLICATION)

MINI-COMPUTERS

	1982 (%)	1983 (%)	1984 (%)	1985 (%)	1986 (%)	1987 (%)	1988 (%)
CROSS INDUSTRY (BY APPLICATION)							
Planning & Analysis	40	39	38	37	39	39	39
Accounting	46	45	42	42	44	44	44
Human Resources	47	47	48	49	51	53	57
Engineering/Scientific	44	44	45	45	47	48	50
Education/Training	33	34	34	33	34	35	37
Other	38	38	37	36	37	38	39

INPUT

EXHIBIT IV-5C

CROSS INDUSTRY APPLICATIONS SOFTWARE
(BY APPLICATION)

MAINFRAME COMPUTERS

	1982 (\$M)	1983 (\$M)	1984 (\$M)	1985 (\$M)	1986 (\$M)	1987 (\$M)	1988 (\$M)
CROSS INDUSTRY (BY APPLICATION)							
Planning & Analysis	175	259	359	475	601	787	942
Accounting	279	361	449	535	613	729	876
Human Resources	128	155	177	201	218	234	243
Engineering/Scientific	48	59	68	80	92	109	134
Education/Training	13	18	28	39	57	84	122
Other	105	136	155	175	204	234	280
Subtotal	749	988	1236	1505	1786	2177	2597

INPUT

EXHIBIT IV-5C`

CROSS INDUSTRY APPLICATIONS SOFTWARE (BY APPLICATION)

MAINFRAME COMPUTERS

	1982	1983	1984	1985	1986	1987	1988
	(%)	(%)	(%)	(%)	(%)	(%)	(%)
CROSS INDUSTRY (BY APPLICATION)							
Planning & Analysis	43	41	38	35	32	31	29
Accounting	48	47	46	43	39	37	35
Human Resources	50	50	48	46	43	40	34
Engineering/Scientific	48	47	45	43	39	37	35
Education/Training	38	36	34	31	29	28	26
Other	40	40	37	34	32	30	29

INPUT

EXHIBIT IV-6

TOTAL SYSTEMS SOFTWARE

	1982	1983	1984	1985	1986	1987	1988
	(\$M)	(\$M)	(\$M)	(\$M)	(\$M)	(\$M)	(\$M)
SYSTEMS SOFTWARE							
Discrete Manufacturing	665	911	1230	1623	2111	2701	3377
Process Manufacturing	418	535	696	911	1212	1612	2144
Transportation	109	147	200	270	362	485	645
Utilities	121	157	209	272	340	411	490
Banking	172	229	311	411	534	694	902
Insurance	184	243	321	414	521	641	776
Medical	88	121	162	213	277	352	444
Education	48	57	67	78	89	100	112
Retail Distribution	96	132	179	233	298	372	450
Wholesale Distribution	86	114	150	192	242	300	369
Federal Government	445	574	758	985	1271	1601	1953
State/Local Government	140	168	198	228	262	299	341
Services	58	75	97	125	157	196	243
Other	55	71	92	117	149	189	236
TOTAL	2685	3534	4670	6072	7825	9953	12482

INPUT

EXHIBIT IV-6A

TOTAL SYSTEMS SOFTWARE

MICROCOMPUTERS

	1982 (\$M)	1983 (\$M)	1984 (\$M)	1985 (\$M)	1986 (\$M)	1987 (\$M)	1988 (\$M)
SYSTEMS SOFTWARE							
Discrete Manufacturing	20	55	98	162	232	324	405
Process Manufacturing	13	32	56	91	133	177	257
Transportation	3	9	20	32	51	73	103
Utilities	1	8	17	27	34	45	59
Banking	3	14	28	41	53	76	108
Insurance	4	10	22	37	52	71	93
Medical	4	7	13	23	33	42	58
Education	1	3	5	7	10	13	15
Retail Distribution	3	9	18	30	42	60	77
Wholesale Distribution	3	7	14	25	36	51	66
Federal Government	4	29	61	99	153	224	293
State/Local Government	1	10	18	27	34	42	48
Services	1	5	9	14	24	35	46
Other	4	6	7	11	13	19	24
TOTAL	65	203	386	627	900	1252	1652

INPUT

EXHIBIT IV-6A'

TOTAL SYSTEMS SOFTWARE

MICROCOMPUTERS

	1982 (%)	1983 (%)	1984 (%)	1985 (%)	1986 (%)	1987 (%)	1988 (%)
SYSTEMS SOFTWARE							
Discrete Manufacturing	3	6	8	10	11	12	12
Process Manufacturing	3	6	8	10	11	11	12
Transportation	3	6	10	12	14	15	16
Utilities	1	5	8	10	10	11	12
Banking	2	6	9	10	10	11	12
Insurance	2	4	7	9	10	11	12
Medical	4	6	8	11	12	12	13
Education	3	6	8	9	11	13	13
Retail Distribution	3	7	10	13	14	16	17
Wholesale Distribution	3	6	9	13	15	17	18
Federal Government	1	5	8	10	12	14	15
State/Local Government	1	6	9	12	13	14	14
Services	2	6	9	11	15	18	19
Other	7	8	8	9	9	10	10

INPUT

EXHIBIT IV-6B

TOTAL SYSTEMS SOFTWARE

MINI-COMPUTERS

	1982 (\$M)	1983 (\$M)	1984 (\$M)	1985 (\$M)	1986 (\$M)	1987 (\$M)	1988 (\$M)
SYSTEMS SOFTWARE							
Discrete Manufacturing	346	465	615	812	1077	1405	1790
Process Manufacturing	209	268	341	446	606	822	1115
Transportation	35	46	58	76	105	146	194
Utilities	62	79	102	131	167	206	245
Banking	57	73	100	136	198	291	397
Insurance	37	51	74	95	135	186	233
Medical	48	64	84	109	141	183	235
Education	21	25	30	36	42	49	58
Retail Distribution	41	55	73	93	122	156	194
Wholesale Distribution	47	60	77	92	114	138	170
Federal Government	156	189	235	296	381	464	586
State/Local Government	69	77	89	100	115	138	164
Services	32	40	49	63	75	90	112
Other	29	38	50	63	82	104	132
TOTAL	1188	1530	1977	2546	3360	4377	5623

INPUT

EXHIBIT IV-6B'

TOTAL SYSTEMS SOFTWARE

MINI-COMPUTERS

	1982 (%)	1983 (%)	1984 (%)	1985 (%)	1986 (%)	1987 (%)	1988 (%)
SYSTEMS SOFTWARE							
Discrete Manufacturing	52	51	50	50	51	52	53
Process Manufacturing	50	50	49	49	50	51	52
Transportation	32	31	29	28	29	30	30
Utilities	51	50	49	48	49	50	50
Banking	33	32	32	33	37	42	44
Insurance	20	21	23	23	26	29	30
Medical	54	53	52	51	51	52	53
Education	44	44	45	46	47	49	52
Retail Distribution	43	42	41	40	41	42	43
Wholesale Distribution	55	53	51	48	47	46	46
Federal Government	35	33	31	30	30	29	30
State/Local Government	49	46	45	44	44	46	48
Services	56	53	51	50	48	46	46
Other	53	53	54	54	55	55	56

INPUT

EXHIBIT IV-6C

TOTAL SYSTEMS SOFTWARE

MAINFRAME COMPUTERS

	1982 (\$M)	1983 (\$M)	1984 (\$M)	1985 (\$M)	1986 (\$M)	1987 (\$M)	1988 (\$M)
SYSTEMS SOFTWARE							
Discrete Manufacturing	299	392	517	649	802	972	1182
Process Manufacturing	196	235	299	374	473	613	772
Transportation	71	93	122	162	206	267	348
Utilities	58	71	90	114	139	160	186
Banking	112	142	183	234	283	326	397
Insurance	144	182	225	282	333	385	450
Medical	37	50	65	81	102	127	151
Education	25	29	31	35	37	38	39
Retail Distribution	52	67	88	110	134	156	180
Wholesale Distribution	36	47	60	75	92	111	133
Federal Government	285	356	462	591	737	913	1074
State/Local Government	70	81	91	100	113	120	130
Services	24	31	39	49	58	71	85
Other	22	28	35	43	54	66	80
TOTAL	1431	1802	2307	2899	3565	4324	5207

INPUT

EXHIBIT IV-6C'

TOTAL SYSTEMS SOFTWARE

MAINFRAME COMPUTERS

	1982 (%)	1983 (%)	1984 (%)	1985 (%)	1986 (%)	1987 (%)	1988 (%)
SYSTEMS SOFTWARE							
Discrete Manufacturing	45	43	42	40	38	36	35
Process Manufacturing	47	44	43	41	39	38	36
Transportation	65	63	61	60	57	55	54
Utilities	48	45	43	42	41	39	38
Banking	65	62	59	57	53	47	44
Insurance	78	75	70	68	64	60	58
Medical	42	41	40	38	37	36	34
Education	53	50	47	45	42	38	35
Retail Distribution	54	51	49	47	45	42	40
Wholesale Distribution	42	41	40	39	38	37	36
Federal Government	64	62	61	60	58	57	55
State/Local Government	50	48	46	44	43	40	38
Services	42	41	40	39	37	36	35
Other	40	39	38	37	36	35	34

INPUT

